

CLAIMS

1. A damascene method for use in forming a magnetic head, comprising:
forming a hard mask layer over an insulator layer;
5 forming a photoresist layer over the hard mask layer;
performing an image patterning process to produce a pattern in the photoresist layer;
etching to remove portions of the hard mask layer in accordance with the pattern;
etching to remove portions of the insulator layer in accordance with the pattern;
10 etching to remove remaining portions of the etched hard mask layer;
electroplating an electrically conductive material within the etched portion of the insulator layer; and
performing a planarization process over the resulting structure.
- 15 2. The damascene method of claim 1, wherein the planarization process is improved by the act of etching the remaining portions of the etched hard mask layer.
3. The damascene method of claim 1, for use in forming a write coil for the magnetic head.
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4. The damascene method of claim 1, wherein the electrically conductive material comprises copper (Cu).
5. The damascene method of claim 1, wherein the hard mask layer comprises
25 SiO₂.
6. The damascene method of claim 1, wherein the hard mask layer comprises Ta₂O₅.

7. The damascene method of claim 1, wherein the planarization process comprises a chemical-mechanical polishing (CMP).

8. The damascene method of claim 1, wherein the acts of etching to remove portions of the hard mask layer and the insulator layer in accordance with the pattern comprise plasma etching.

9. The damascene method of claim 1, wherein the acts of etching to remove portions of the hard mask layer and the insulator layer in accordance with the pattern comprises a reactive ion etch (RIE).

10. The damascene method of claim 1, wherein the act of etching to remove remaining portions of the hard mask layer comprises a reactive ion etch (RIE).

11. The damascene method of claim 1, wherein the act of etching to remove remaining portions of the hard mask layer comprises a reactive ion etch (RIE) with use of a fluorine gas.

12. The damascene method of claim 1, wherein the act of etching to remove remaining portions of the hard mask layer comprises a low-bias and isotropic reactive ion etch (RIE).

13. The damascene method of claim 1, further comprising:
wherein the act of etching to remove portions of the hard mask layer in accordance with the pattern comprises a reactive ion etch (RIE) with use of a fluorine gas; and

wherein the act of etching to remove remaining portions of the hard mask layer comprises a reactive ion etch (RIE) with use of a fluorine gas.

14. A method of forming a write coil of a magnetic head, comprising:
forming a hard mask layer over an insulator layer;
forming a photoresist layer over the hard mask layer;
performing an image patterning process to produce a write coil pattern in the
5 photoresist layer;
etching to remove portions of the hard mask layer in accordance with the write
coil pattern;
etching to remove portions of the hard-baked resist in accordance with the write
coil pattern;
10 etching to remove remaining portions of the etched hard mask layer;
electroplating an electrically conductive material comprising copper (Cu) within
the etched portion of the hard-baked resist; and
performing a chemical-mechanical polishing (CMP) process over the electrically
conductive material.

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15. The method of claim 14, wherein the CMP process is improved by the act
of etching the remaining portions of the etched hard mask layer.

16. The method of claim 14, wherein the hard mask layer comprises SiO₂.

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17. The method of claim 14, wherein the hard mask layer comprises Ta₂O₅.

18. The method of claim 14, wherein the acts of etching to remove portions of
the hard mask layer and the hard-baked resist in accordance with the write coil pattern
25 comprise a reactive ion etch (RIE).

19. The method of claim 14, wherein the act of etching to remove remaining
portions of the hard mask layer comprises a reactive ion etch (RIE).

20. The method of claim 14, wherein the acts of etching to remove remaining portions of the hard mask layer comprises a reactive ion etch (RIE) with use of a fluorine gas.

5 21. The method of claim 14, wherein the act of etching to remove remaining portions of the hard mask layer comprises a low-bias and isotropic reactive ion etch (RIE).

22. The method of claim 14, further comprising:
10 wherein the act of etching to remove portions of the hard mask layer in accordance with the write coil pattern comprises a reactive ion etch (RIE) with use of a fluorine gas; and

wherein the act of etching to remove remaining portions of the etched hard mask layer comprises a RIE with use of a fluorine gas.

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